DOCUMENT RESUME

ED 399 779 FL 024 104

AUTHOR Ogden, Richard
TITLE Prosodies in Finnish.
PUB DATE Mar 96
NOTE 51p.; For complete volume, see FL 024 097.
PUB TYPE Reports - Evaluative/Feasibility (142) -- Journal Articles (080)
JOURNAL CIT York Papers in Linguistics; v17 p191-239 Mar 1996

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS *Articulation (Speech); Descriptive Linguistics; *Finnish; Foreign Countries; *Language Patterns; Language Research; Linguistic Theory; *Phonetics; *Suprasegmentals; Uncommonly Taught Languages

ABSTRACT

A study describing Finnish phonetics and analyzing prosodic properties is reported. Subjects were two female 17-year-olds, speakers of standard Finnish and well acquainted with each other. Data were drawn from two sources: a conversation between the two, in which one described a picture so the other could draw it, and one a set of stories narrated by the informants based on a series of connected pictures. The report first describes phonetically the informants' speech, including consonants with complete oral closure, velic opening and oral closure, lateral airflow, tapped and trilled articulations, open approximation, friction with and without voicing, voicelessness/breathy voice, glottal stop and creaky voice, resonance features, vowels, diphthongs, velic opening and vocalic articulations, variability of vowel quality, voiceless vowels, and quantity and duration. It then outlines a prosodic analysis of six features of inter-word junctions. It is concluded that a phonological statement can be made that takes into consideration phonetic characteristics that are considered irrelevant in most phonologies. Contains 31 references. (MSE)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED 399 779

PROSODIES IN FINNISH*

Richard Ogden

PERMISSION TO REPRODUCE AND
DISSEMINATE THIS MATERIAL
HAS BEEN GRANTED BY

Stephen J
Hartow

TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)
This document has been reproduced as
received from the person or organization
originating it.
☐ Minor changes have been made to
improve reproduction quality.
• Points of view or opinions stated in this
document do not necessarily represent
official OERI position or policy.

FL 024104

BEST COPY AVAILABLE

PROSODIES IN FINNISH*

Richard Ogden

Department of Language and Linguistic Science
University of York

1. Introduction

Recently, it has been argued that phonetic detail ought to be accounted for by phonology: to ignore detail is to produce analyses of linguists' idealisations of data, rather than of real spoken material. Some studies of English have shown that there is phonetic detail beyond what had been expected: Zsiga (1994) has shown that post-lexical processes in English produce different kinds of [ʃ] from those produced by the application of either level 1 or level 2 rules; Manuel et al. (1992) have shown that /ð/ in English may under certain circumstances be realised by nasal portions with dental articulation and a dark secondary resonance (low F2); Hawkins & Slater (1994) show that by modelling fine details of coarticulatory behaviour it is possible to produce significantly more intelligible synthetic speech which is also more robust in difficult listening conditions. In a somewhat more theoretical vein, Docherty et al. (1995) argue that unless phonetic detail and variability is described within a phonological analysis, the analysis is seriously flawed, since it remains unaccountable to observed data. Hawkins (1995) argues that fine phonetic detail contributes to what she calls the *coherence* (naturalness) of speech. If coherence is considered important, hitherto

* Parts of this paper appear in Ogden (1995a). My particular thanks to Steve Harlow, John Kelly, Gerry Knowles, John Local for their help with that work. Thanks are also due to my informants, and to Tapani Salminen, who helped me decipher some of the material and produce an orthographic version of it.

York Papers in Linguistics 17 (1996) 191-239
© Richard Ogden

ignored details of speech become central properties of the linguistic system.

This paper presents a description of Finnish phonetics and a Firthian Prosodic Analysis of some of the data. Rather than starting from citation forms, the analysis is based on some of the observed phonetic detail of spontaneously produced speech.

This paper has two main sections. The first section gives a general phonetic description of my informants' speech, while the second section pays particular attention to the ways in which words in the recorded material are joined together, and presents a Firthian Prosodic Analysis of these word joins. Where the informants produce forms that are not Standard, the non-Standard forms are given in parentheses. Such forms are generally shorter than Standard forms. My impressionistic records contain as much detail as deemed necessary for the analysis presented.

The material discussed in this paper was elicited from two informants (ET and SU). Both were female, and were 17 years of age at the time of recording. They were good friends and were still at school in Kuopio, where they received instruction in Standard Finnish.[1] Since there are no substantive differences between ET and SU, utterances from both speakers are not distinguished in the text.

The material comes from two sources. The first one is a conversation between the two informants, where one describes to the other a picture so that the other informant can draw the picture seen only by the first informant as exactly as possible. The second source is a set of stories narrated by the informants based on a series of connected pictures.

My informants, who come from Kuopio, described their speech as Standard Finnish. The material elicited from them largely matches descriptions of Standard Finnish (eg. Wiik 1981, Karlsson 1982), although occasionally I obtained from my informants material which is considered typical of the Savo dialect of their home town. A linguistically trained informant from the Häme region of Finland

1 Standard Finnish is a somewhat artificial language which was formalised in the 19th century. It contains elements taken from the two main dialect areas of Finnish, East and West. It is the prestige language of Finland, and the form most commonly cited by Finns to foreigners. It is also the language used in broadcasting, publishing and education.

(roughly the central south-west of Finland) identified my informants' speech as distinctively Savo on the basis of intonation. The only other striking aspects of my informants' speech in comparison to descriptions of Standard Finnish were the rhythmical structure of their words, which matches that described for the Savo dialects (Wiik & Lehiste 1968, Wiik 1975, Kettunen 1981), and their use of the glottal stop (Itkonen 1965).

2. An outline of Finnish phonetics.

My observations presented in this section are not extensive, but nonetheless provide some detail beyond commonly accepted general descriptions of Finnish phonetics[2] (e.g. Sovijärvi 1957, Wiik 1981). Notes on tempo are included, where relevant, between braces (in the manner of extIPA). Some of the standard assumptions made about Finnish pronunciation are challenged by the data in this paper. In particular, general descriptions typically do not discuss the voicing or aspiration of plosives, the precise variability in the articulation of the 'labiodental approximant' (/v/), the extent of laryngeal features such as breathiness and creaky voice, and the variability in the qualities of vowels. Standard descriptions of Finnish also concentrate on citation forms: the material on which these notes are based is not citation form, but speech produced in a relatively natural and spontaneous fashion.

2.1 Consonants with complete oral closure

Complete closure in Finnish can combine with partially or entirely voiced closure, or with voiceless closure. Complete oral closure with velic opening is only combined with voicing. The release of oral closure without nasality is generally unaspirated and the voice onset time is approximately 10-30ms (Suomi 1980, Lahti 1981). The commonest closure in normal rate speech is voiceless.

2 In this paper, phonetic material is presented using an ipa font. Phonological material appears **in bold**. Orthographic material appears *in italics*.

1. {all n̥ măoŋ all} kan:u[3]
   tämä on kannu
   this is a jug

2. ja nok:ă õn tõm:ŏnĕn suikŭlĕ̯
   ja nokka on tommoinen suikula
   and the spout is a kind of oval

3. no: pi:r:ĕ ɣ:ɑ̃:
   no, piirre vaan!
   go ahead and draw it then!

However, [k] may be aspirated, as in (4). It is not clear whether this is because it is followed by a following close front spread vowel, or whether it is because the word *kirkas* is in focal position and is pronounced relatively slowly:

4. lam·pŭŋ ʋalõ:ŋ {len kʰirkas len}
   lampun valo on kirkas
   the light from the lamp is bright

The spectrogram in Figure 7 below provides a visual of some of the phonetic characteristics of this utterance (4). Note that the first velar plosive (1) is accompanied by about 50ms of aspiration, while the second one (3) has no aspiration and the VOT is shorter, at 30ms. Note also that the apical ɟap (2) is voiced, not voiceless.

3 Phonetic material contained between curly brackets is characterised throughout by the parameter(s) indicated subscript: {all } = allegro; {len} = lento; {p(p)} = pian(issim)o; {rall} = rallentando.

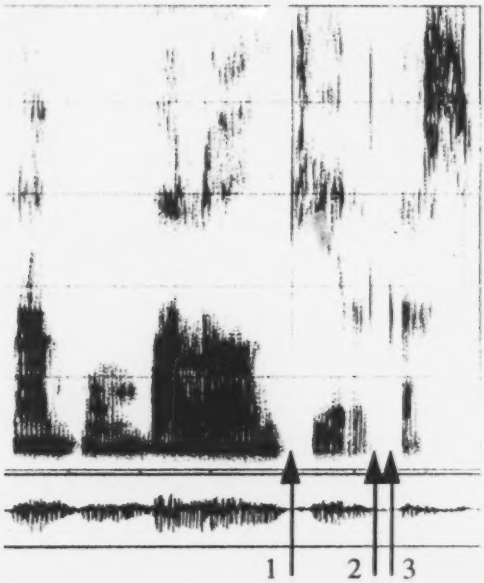

Fig. 1: [lam·pǔŋ valõ:ŋ kʰirkas]
'the light from the lamp is bright'

In the example in Fig. 1, the first velar plosive whose burst is at (1) is produced with aspiration and 50ms VOT, while the second one (at 3) is produced without aspiration and with VOT of 25ms, which fits in better with descriptions in the literature (Suomi 1980, Lahti 1981)

[d] occurs only in morphophonological alternation with [t]. It is articulated as a very short voiced plosive, and usually has an alveolar rather than dental place of articulation (Suomi 1980).[4] It is accompanied by a 'dark' resonance. Its closure duration is very short: usually about half the length of the voiceless plosives.

4 /d/ occurs only initially in syllables which (i) contain a short vowel followed by a consonant that closes the syllable or (ii) for lexical or morphosyntactic reasons pattern in the same way (i.e. as short closed syllables) (Karlsson 1982).

5. ĕn tʲe·dă
en tiedä
I don't know

In fast speech, plosives can have a voiced closure and release when they occur in a voiced stretch of speech. Voicing with closure and release is not common word-initially. It occurs most frequently in words formed from pronouns, as in *tommoisella* in example 6, and after periods of voicing and lateral airflow:

6. {all tseõ ʋɑ̃: dom:ozelə acc ʔyfiel·ă ʋi:ʋăl·ă tehtў all}
se on vaan tommoisella yhdellä viivalla tehty
it's made with one sort of line

7. nayt:a: korʋaldə
näyttää korvalta
looks like an ear

8. nayt:{all a:yð ne ða:ldah all}
näyttääkö ne täältä?
do they look like this?

9. boh·jăn
pohjan
bottom (gen.)[5]

5 Said as a repetition of the previous speaker; the previous utterances are recorded in example (43).

8

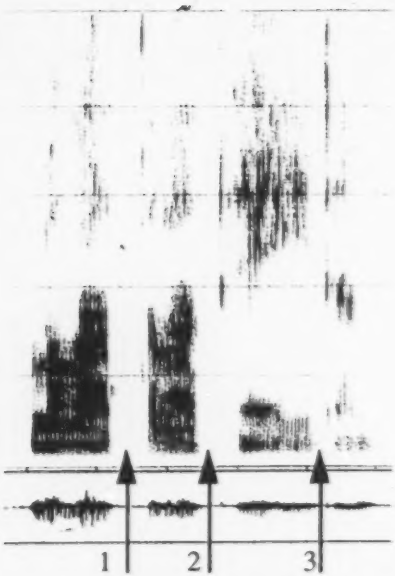

Fig. 2: [luvat ovat heidän]
'the licences belong to them'

Note the three different closure durations for the plosives. (1) was measured at 90ms, (2) 60ms, and (3) at 40ms. In this instance, the amount of voicing for [d] is very small, and the duration probably gives the strongest cue to the status of the plosive.

When short and in the initial portion of an unstressed syllable, plosives can sometimes be articulated with a stricture of less close than complete closure, giving [p̞ t̞ k̞] or even friction and voicing. There are insufficient instances of this in my data for it to be possible to work out whether there are any systematicities in the way this is used. However, it seems true to say that the weaker closure occurs before unstressed syllables, and only when the stretch as a whole is voiced. Closure portions are always followed by audible release within the word (where there is only one plosive-plosive cluster: [tk]). However,

between words, the plosive [t] has a variety of release types. It may be released medially:

10. {p namʸ·ɑt p} kɑ:p:ĕjă
nämä ovat kaappeja
these are cupboards

When a lateral follows, it may be released laterally:

11. {p namɑovɑtˡ p} lɑmp:ăjă
nämä ovat lamppuja
these are lamps

When a bilabial plosive follows, there may be no audible release:

12. hɑtut' pɑn:ɑ:m pɑ:hɑ̃n
hatut pannaan päähän
hats are put on the head

It may be that in the case of apical followed by bilabial closure, the bilabial closing gesture masks the release of the apical closure. In other words, the bilabial closure is timed so that it happens before the apical release.

Unreleased closure is a common way for a speaker to keep hold of a turn in a conversation. When this closure is released, the next stretch of speech sounds like it begins with a plosive (e.g. (7) above, which begins with a portion transcribed [ts-] and is preceded by [-ʔ] and a pause).

2.2 Velic opening and oral closure: [m ŋ n ɲ]

Nasality co-occurs with complete oral closure made at various places in the oral tract: bilabial, labio-dental, dental, and velar. Nasality and voicing always co-occur in Finnish. Finally in the syllable, nasal consonants are articulated homorganic with any subsequent plosive; otherwise they are articulated as apico-dentals. (See Section 3.1 **n**.) [n]

is produced with the tongue tip just back of dental and forward of the alveolar ridge.

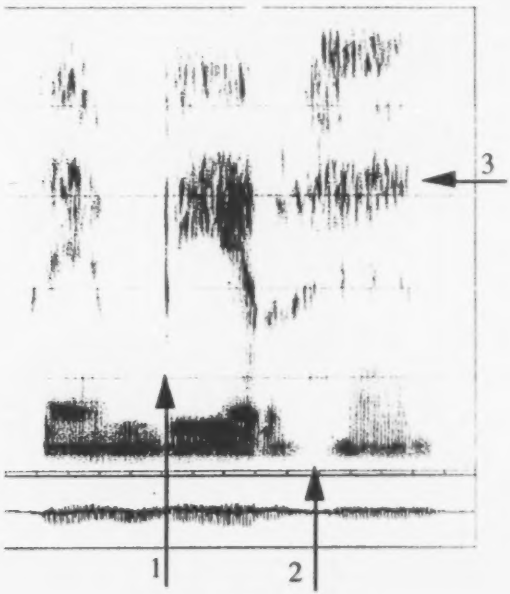

Fig. 3: [tɛ̃ĩŋˑˈirɦĩ̯ːn]
'I made a mistake'

Note how the nasal portion ends with a very obvious plosive-type release (1); the low amplitude of voicing for the initial part of the last syllable (2), and the breathiness throughout this final syllable (3).

13. (p e mːa tiˑa milˑtä ne nːaytːaː pp)
en minä (mä) tiedä (tiä) miltä ne näyttää
I don't know what they look like

11

14. mĩŋkălainẽ se ʔalaˑpą̆ː oliˑh
minkälainen se alapää oli?
what was the bottom bit like?

15. noh: tam oŋ kanːŭŋ kauˌla
no, tämä on kannun kaula
well, this is the neck of the jug

In portions with nasal and labiodental articulations, there is a great deal of variability, from apical contact with nasality to labiodental contact with nasality. In the latter case, it may be that this labiodental contact is completely coextensive with nasality, and that length together with labiodentality are the only exponents of the syllable-initial C. Release is marked with a superscript ! in (20).

16. seinăn vierĕsːă
seinän vieressä
next to the wall

17. tɛ̃ĩmˈˈirɦɛ̆ːn
tein virheen
I made a mistake

2.3 Lateral airflow

Laterals are articulated dentally in Finnish. When a nasal precedes a lateral, nasality may extend into the lateral portion, and laterality and nasality may be produced simultaneously. Finnish laterals are on the whole darker than their English counterparts, but are never as heavily velarised as finally in English syllables.

2.4 Tapped and trilled articulations

Taps and trills seem to be in free variation in my informants' speech; but taps (but not trills) are in free variation with the voiced plosive [d]. Another informant (from Häme) has trills and taps where

my informants have [d]. In citation forms and careful speech, the trill [r] has 2-3 vibrations of the tongue when short, and 5-6 when long. In fast speech, the tap [ɾ] counts as the exponent of 'short' and the trill has 2-3 vibrations of the tongue, and counts as the exponent of the category 'long'. Both taps and trills are pronounced voiced in clusters with voiceless plosives: [kerto:], not [keɾto:] *kertoo*, 'tell', 3ps. present tense. Initially however they may sometimes combine with a short period of voicelessness.

18. ma oṁ pi:rtänyh
minä (mä) olen (oon) piirtänyt (piirtääny)
I have drawn (it)

19. lafiel:ä reuna:
lähellä reunaa
near the edge

20. tom:önēŋ korvä
tommoinen korva
a sort of ear

21. vih·re:l·a ʔēnsin te:t var:ɐt
vihreällä ensin teet varrat
you do the stalks first in green

Sometimes lateral and trill articulations are found with initial voiceless portions utterance-initially:

22. ɻas·kĕ ɣi:tē:n
laske viiteen
count to five

23. ɻakĕ·nsîⁿ talon
rakensin talon
I built a house

13

2.5 Open approximation

Two approximants occur in Finnish: palatal and labiodental. The labiodental approximant is often accompanied by a somewhat ballistic lower lip gesture, producing something like a labiodental flap. Sometimes in the initial portion of a stressed syllable, the stricture for the labiodental approximant is that of rather close approximation, producing weak friction; it is not uncommon word-initially to hear a voiced labiodental plosive (see Fig. 3). The palatal approximant does not exhibit this wide range of variability in its degree of stricture.

Approximants only occur syllable-initially. (Flifilet 1971; Suomi 1985a and the references therein consider whether this distributional pattern is evidence for treating the final component of diphthongs, which may be [i] or [u], and initial approximants as allophones of the same phoneme.)

24. tṵn'$_{\text{rall}}$ tĕmɑton lɑjiç $_{\text{rall}}$[6]
tuntematon lajike
an unknown species

25. no te: ʋːɑᵊkːɑ ruiskukːiʁ
no, tee vaikka ruiskukkia
well, why don't you do cornflowers

Sometimes in back harmonic words, the palatal approximant is very back, and is transcribed as an advanced velar glide. There are not enough instances of it in my data to be able to say anything very conclusive about it.

26. hɑpːoɯ̯ ʁ
happoja
acid, part. pl

6 Note here that the utterance ends voiceless, as is common for utterance-finals. Note also that it is a dorsal articulation, and that it is front. It would be inappropriate to regard this as some form of deletion, since all the phonetic properties demonstrated at the end of this word can be shown to be systematic. See Section 3.6 h.

2.6 Friction with and without voicing

The fricative [s] can be produced in Finnish with the tongue tip down. This produces a rather flatter, duller sound than in, say, English. The groove is also wider than in English, enhancing this impression of dullness (cf. Sovijärvi 1957).

Another variant of [s] is also found. In this articulation, the groove made by the tongue is considerably narrower than in English, and the tongue tip is up. The groove made by the tongue forms a narrow V-shape from the blade to the tip. The result is that this [s] sounds whistly to English speakers. The data I have suggest (but not conclusively) that the whistly [s] sound occurs before front, spread non-open vowels. When these two articulations are combined with secondary articulations affecting mostly the dorsum and harmonising with the resonances of the neighbouring vowels, a gradual spectrum of qualities is produced rather than the simple two-way split suggested here. Nevertheless, the 'whistly' articulations do stand out in the recordings.

The records below show examples. The 'flat [s]' is transcribed [ṣ] and the 'whistly [s]' as [ʂ]:

27. aṣuin ṣi:nä talɔṣ:ä
asuin siinä talossa
I lived in that house

28. lafide aʂe'mal:e
lähde asemalle!
go to the station

29. kato'ʂĩ m:et'ʂä:n
katosin metsään
I disappeared into the forest

The different types of [s] sound are not marked elsewhere in this paper. Between voiced sounds and within words, weak voicing may cooccur with apical friction which is of short duration:

30. nouzĕ s:ăŋ:ÿstą
nouse sängystä!
get out of bed

There are in the data some instances where a word begins with initial voicing and friction. These words are commonly pronouns, as in the words *täältä* (demonstrative pronoun, ablative sg.) and *tuonne* (demonstrative pronoun + illative sg.) in the examples below; strictures of relatively open approximation in fast speech are sometimes also found instead of strictures of complete closure. In these cases, the friction is rather weak.

31. nayt:{all a:ɣð ne ða:ldah all}
näyttääkö ne täältä?
do they look like this?

32. {all jos s̩ita küðo·t s all} ʔylha:lta pain
jos sitä katsottaisiin (katottas) ylhäältä päin
if you looked at it from above

33. jə kɑɦʊð tule: {all ðone ʔoiɻɛ·le all} pwolo̯l:e
ja kahva tulee tuonne (tonne) oikealle puolelle
and the collar comes up to the right-hand side

2.7 Voicelessness, breathy voice: [̥ h ɦ]

Phonetically, it is perhaps best to see Finnish [h] as a voiceless version of an adjacent vowel. This is also Sweet's description of Finnish [h] (Sweet 1908, in Henderson (ed.) 1971: 174). 'There is also a "strong" aspirate which occurs in Finnish and other languages, the formation of which the full vowel position is assumed from the beginning of the aspiration, which is therefore a voiceless vowel.' On the other hand, the degree of aspiration at the syllable margins is greater than in the voiceless vocalic syllabics noted below.

[ɦ] can be treated in a similar way, as a breathy voice version of an adjacent vowel. [ɦ] occurs between two voiced sounds, and [h] elsewhere. Both [h] and [ɦ] are found syllable-initially and finally.

In my informants' speech, [ɦ] as a distinct portion of breathy voicing focused at the syllable margin is frequently not observed, but breathiness throughout the syllable is. This is especially interesting in view of some of the metathesis which is supposed to be fossilised in Finnish (cf. Rapola 1966: 256ff). In the Standard language, there are pairs of words such as *valhe*, 'a lie' and *valehtella* 'to tell a lie'.[7] When my informants were asked to give the word for 'a lie' they consistently produced [ʋɑlʲe̤ɦ], with breathiness throughout the whole of the second syllable (or if anything concentrated on the latter portion of it); but certainly not initially in the syllable as the (generally phonemic) orthography implies.Note that the lateral portion of this word is pronounced half-long, where half-long duration serves as the regular phonetic exponent of the first element of a CC-cluster (cf. Ogden 1995b).

Fig. 4 presents a spectrogram a token of the word *hiihdin*, 'I skied', where the whole of the first syllable is pronounced breathy .

7 Similarly, there is the word *paras*, 'best', which has the stem *parhaa-*; /h/ may not occur finally, since only apical sounds occur in this position. This instance can be seen therefore as an example of metathesis of friction.

17

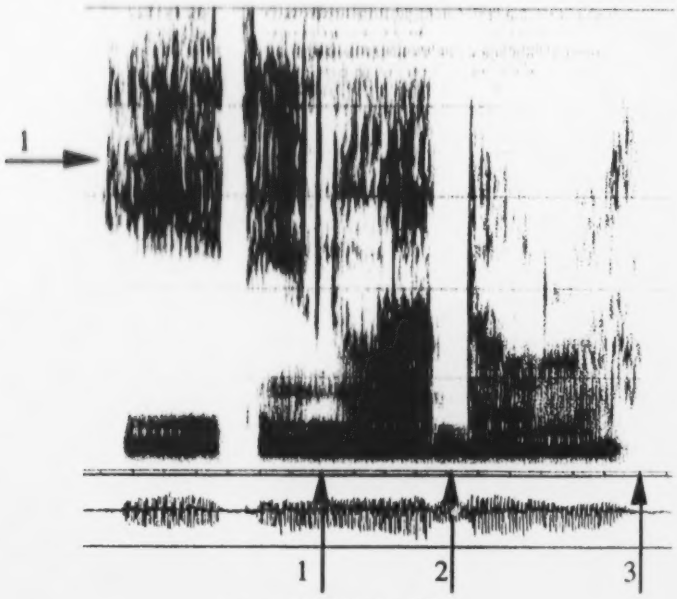

Fig. 4: [hi̯:fidĩn lɑdŭl:ɐ̯̆]

'I skied on the track'

Note the breathiness evident throughout the first syllable (1); the very short voiced closure for the [d] sounds (2), and the final voicelessness (3).

At the end of a syllable, the tongue gesture for the vocalic part of the syllable may be somewhat raised and accompanied by voicelessness, producing weak friction, as in [lɑχti], 'Lahti', a place name.

34. ʋi̯:ʋɑistɐ̯̆ tɕhtɏ̆jɑ̆
viivoista tehtyjä
made of lines

35. jɑtkɑt vɑhɑ̃
jatkat vähän
you go on a bit

18

Voicelessness is frequently used to mark utterance finality. Stages into complete voicelessness from voicing are typically: voicing, creak, voicelessness. Voicelessness may frequently be accompanied by quietness. Sometimes the voicelessness is rather 'strong' (recall Sweet's observations), and is then transcribed as [h], with the meaning that a more forceful articulation is used that that implied by the symbolisation using a voiceless vowel.

36. ihmẽˑl̥ːisaːke tːone ʔoikẹ̝ːle pˑwo̝ːlːe̝h
ihmeen lisäke tuonne (tonne) oikealle puolelle
a strange appendage on to the right hand side

37. (pp e mːa tiˑa milˑtä ne nːa̝ytːaː pp)
en minä (mä) tiedä (tiä) miltä ne näyttää
I don't know what they look like

38. kisːo̝ ʔistui mɑtɒlːɐ̯
kissa istui matolla
the cat was sitting on the carpet

See also below, 'Voiceless vowels'.

2.8 Glottal stop and creaky voice: [ʔ ̰]

The glottal stop and creaky voice are frequently used in the speech of my Savo informants to mark the beginning of words which have a vowel initially. Lehiste (1965) presents some similar data comparing vowel-vowel sequences with and without intervening syllable boundaries; those with syllable boundaries may use creaky voice as in Fig. 5.

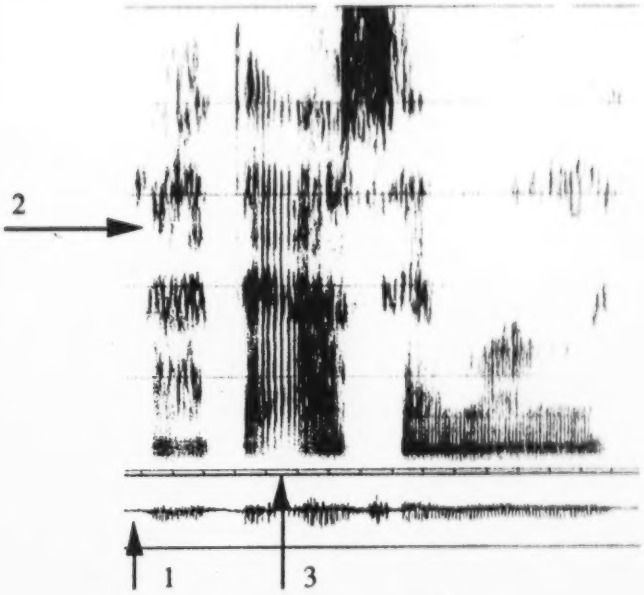

Fig. 5: [ɻąñde_asĕmaɭːɕ]
'go to the station'

Note the initial voicelessness (1), breathiness throughout the first syllable (2), and the very striking creaky voice between the second and third syllables (3). Much of the transition from one vowel sound to the next coincides with the period of creaky voice.

39. õŋksĕ pyøre: sea ʔalhaːlːa ʔoleˑvah
onko se pyöreä, se alhaalla oleva?
is it round, the one underneath?

40. aikă ʔisoˑ
aika iso
quite big

41. ʔẽn:sĩn ʔotɑ· m:us·tɑ̆ tus:i
ensin ota musta tussi
first take the black pen

42. {f all mĩŋkɑ̆lɑinẽ se ʔɑlɑ· all f}pɑ̨: oli·h
minkälainen se alapää oli?
what was the bottom part like?

Another function of glottal stops in conversation seems to be as a device for keeping hold of the turn in the conversation. While one speaker has an unreleased closure, the other speaker does not interrupt:

43. ma pi:rsĩn siĩa·ʔ'... tam pʸø·rў̆lɑ̆ osɑ·n jɑʔ'... ja poh·jɑ̆n
minä (mä) piirsin sitä... tämän pyöryläosan ja... ja pohjan
I drew it... this round bit and... and the bottom

More detailed descriptions of creaky voice are given in Section 3.3 under the exponents of ʔ.

2.9 Resonance features

With the possible exception of [d], consonants in Finnish match their resonance with that of the vowel of the syllable in which they appear. However, there are not such extremes of consonantal articulation that consonants with palatal place of articulation or heavily velarised consonants are produced.[8] These seem not to form part of the Finnish repertoire.

Consonants in words with back harmony are consequently darker than in words with front harmony. One way of delimiting words is a change in the resonance of the consonants at the words' edges:

8 A distantly related language, Nenets, lost 'vowel' harmony early in its development and now has palatalised and velarised consonants. Finnish secondary articulations are not as extreme as these.

44. kaytĭmʲ pʷʸufiɛ·lintŭ
käytin puhelinta
I used the telephone

Note that in this example, the words are kept together by the shared bilabial place of articulation but are kept separate by the different resonances. The resonance of consonants is not marked in my transcriptions unless it is different from what is expected.

Lip-rounding, which is predictable, is similarly not transcribed for consonants, although it must be noted that the lips hold the same gesture over the whole syllable, or in the case of diphthongs over the syllable-initial or syllable-final piece.

As far as [d] is concerned, it could be that it is the low-frequency voicing during the closure which gives the auditory impression of darkness. It should be added that some writers (eg. Karlsson 1971) believe that this voiced alveolar plosive is an import from Swedish and that it came about when the modern language was standardised in the capital Helsinki in the last century—Helsinki was at that time predominantly a Swedish-speaking city. Kettunen's map 65 (Kettunen 1981) shows that [d] only occurs natively in one or two areas on the West coast, which, significantly, are also areas where Swedish has a strong foothold. My informants were able (consciously) to produce dialect forms which used other articulations than the one described here such as a voiced bilabial approximant or a voiced tap. TS, my informant from Häme, regularly uses a voiced apical tap or trill in all contexts where [d] appears in the data presented here.

2.10 Vowels

The symbols used in my records for the vowels are: [a ɑ o ø u y i e ɐ]. This follows the usual IPA practice for Finnish vowels, although the orthography is more common: <ä a o ö u y i e>. The symbol [ɐ] (sometimes also transcribed in my records as [ə] for a slightly closer vowel) is used to represent an open, central quality which is frequently

found in unstressed syllables, particularly very short ones[9]. It is normally accompanied by a diacritic for advancing or retracting.

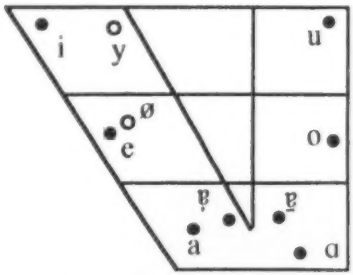

Fig. 6: Vowel quaderilateral showing the approximate qualities of Finnish vowels.

The symbols used in the transcriptions presented in this paper are used as follows: [a] is not as open and front as CV4, nor is [ɑ] as back; its quality is rather more central though very open. The mid vowels [e ø o] are all more mid in quality than their IPA symbolisation implies, though they are hardly less peripheral. [u] is very back and round, almost cardinal. [i] is front and spread. [y] on the other hand is not so front and is less rounded than, say, French [y]. It bears some resemblance to the short German sound [ʏ] as in *wünschen*. Diacritics accompanying vowel symbols modify the values described here, and not cardinal vowel values.

No significant differences in quality have been observed for Finnish vowels depending on their duration (cf. Sovijärvi 1938, Wiik 1965, Engstrand & Krull 1984).

---

9 cf Harms (1964: 62), who uses the symbol [ʌ] for this sound in back harmonic words. He claims it appears only when preceded by a syllable boundary or following a consonant cluster, and only in or beyond the third syllable. My notes do not quite accord with this last observation, and I have observed both fronter and backer varieties.

2.11 Diphthongs

The so-called rising diphthongs of Finnish all end in a close vowel. They are: [ai ɑi oi øi ui yi ei], [ay ɑu ou øy eu] (and, marginally, [ey iu iy]). The diphthongs which end spread do not normally end as close as the symbol [i] implies: they usually fall somewhat short of this, to approximately [e] or [ẹ]. The diphthongs that end spread but which are not in the first syllable of the word are usually 'derived', ie. they are not part of the stem of the word, but arise from the addition of [i], which marks past tense and plural in Finnish.

The so-called opening diphthongs are: [uo yø ie]. These vary in their articulation depending on the speaker's dialect (Kettunen 1981). My own informants pronounced these sounds as scarcely diphthongal. They tended to start with a short close portion opening to a mid portion which nevertheless was quieter than the initial part of the diphthong, e.g. [k̟ʷo:rutet:ɐ̯] 'icing', part. sg., [tʸø:tøn], 'unemployed', nom. sg. In Standard Finnish these vowels have longer initial portions with a mid off-glide. These diphthongs are usually treated as the phonetic exponents of long mid vowels, since in the first syllable (the only place where they occur), [e: o: ø:] — ie. pure, long vowels — are only found in loan words. In native words, therefore, the long vowels are in complementary distribution with the opening diphthongs.

2.12 Velic opening and vocalic articulations

The timing of the lowering of the velum is generally such that it lowers before a complete oral stricture is made, producing vowels which are nasalised before nasal consonants. Word-finally, there is frequently no complete oral stricture, but there is audible nasality throughout the final syllable. Lehiste (1965) shows that the nasalisation of a vowel may serve as a boundary marker in Finnish. The pair *maan isä* and *maa nisäkäs* are distinguished partly by the fact that the first vowel of *maan i-* is nasalised, while in *maa ni-* it is not.

2.13 Variability of vowel quality

Vowel qualities produced by my informants are somewhat variable; this variability can be summarised somewhat, though some of the observations in this section remain rather tentative.

- Very short vowels tend to be centralised.
- Vowels after the palatal glide are frequently fronter in quality than elsewhere; but it is hard to tell whether there is anything substantial to be said here, since these vowels also tend to be very short in my data, occurring as part of the partitive plural suffix.
- Vowels after apical consonants tend to sound slightly fronter in quality than after labial or dorsal consonants.

Some examples from my data will give an impression of the kinds of variability in vowel quality which can be observed.

Compare the formant values for the centre points of the three open vocalic portions in the word [ɑm:ɑ̆t:ĕjɑ̨̆]. The first one has the formant values 855-1520-3335 Hz, and the second one 765-1570-2965 Hz. These are roughly comparable; taking into account the fact that the second one is short and occurs between two consonants, one might expect a lower F1 value; the F3-F2 difference might be explained by the proximity of bilabial closure, which tends to lower all the formant values. The final open vowel however has the formant values 815-1875-2945 Hz, which is quite a lot fronter (i.e. with a higher F2) than the other two open vowels. Bearing in mind the fact that this vowel is also very short, and also next to a palatal approximant (which would have slower formant transitions), this high F2 value might be explained by coarticulation. However, one of my informants produced the word *housujaan* 'his trousers', part. pl. as [housujɑ̨:n]; this makes it more likely that there may be some kind of local harmony between the palatal approximant and the subsequent vowel.

A kind of harmony may be observable within feet. The observations made here are by no means conclusive, though they are suggestive. In the phrase *pidän ammatistani* 'I like my job', it was observed that the third open vowel in the word [ɑm:ɑ̆tistɑ̨ni] was fronter than the other two open vowels (with formant values of 695-1885-3015, thus roughly comparable with the third open vowel in

ammatteja). Three possible explanations seem likely: (1) the vowel is in a foot with two syllables with front resonance: perhaps there is vowel-to-vowel coarticulation; (2) the vowel is surrounded by apical consonantal articulations, which tend to raise F2 and so give the impression of fronter vowels; (3) the functional load on the vowel so late in the word is minimal, and no other vowel could occur in that place in structure and make a difference in meaning, therefore one might expect that this vowel would have the potential to be more variable in quality; example 57 is a similar example of this. It may also be the case that all three explanations have some validity.

2.14 Voiceless vowels

Vowels between voiceless consonants are sometimes voiceless. This seems typical of fast stretches of speech, turn ends, or stretches where as the result of metrical structure the vocalic portion would be very short even if voiced.

45. mitaˑ kukːɑː ne mːuistu̥tːgː
mitä kukkaa ne muistuttaa
what flower do they remind you of?

46. (all jos s̥ita kʌðoˑt s all) ʔylhaːlta pain
jos sitä katsottaisiin (katottas) ylhäältä päin
if you looked at it from above

47. lumˑpu̥t ovat kirkːaitu̥
lamput ovat kirkkaita
the lamps are bright

Just as certain consonants are voiced in stretches which are overall voiced, so it appears that short vowels in stretches which are overall voiceless can be voiceless.

3.15 Quantity and Duration

There are many different quantities for both consonants and vowels in Finnish. At the phonological level, it is usually said that there are two contrastive degrees of length. At the phonetic level however, it is not true to say that there are only two degrees of duration. In my records five degrees of duration are marked: [ᵛ v̆ v vˑ vː]. Note that it is more accurate to see duration as gradient rather than as categorial, so that no matter how refined the transcription, the records remain impressionistic rather than conclusive.

Half-long vowels are found after short open syllables, giving the shape [cvcvˑ] (cf. in particular Wiik & Lehiste 1968, Wiik 1975, who show that the precise duration is a dialectal matter: some dialects have the shape [cvcv]). Half-long vowels in my informants' speech frequently occur also in closed syllables, provided the syllable-final consonant is a sonorant (typically [n]), giving the general shape [cvcvˑn]. This pattern is not found when the final consonant is a voiceless plosive (usually [t]). [cvcvt]. Palomaa (1946) found that vowels before voiceless consonants are shorter than before voiced ones.

Half-long consonants appear as the exponent of the first element of CC-clusters, giving the general shape [cvcˑcv].

Very short vowels are found after heavy first syllables, giving the phonetic shapes [cvvcv̆] and [cvccv̆]. A short vowel after such a stretch may also be very short: [ɑmːɑ̆tːĕjɑ̆ kɑːpĭstɑ̆] *ammatteja*, 'profession' part. pl., *kaapista* 'cupboard', elat. pl.

Factors which may be significant in determining consonant duration are: place in the foot; the weight of preceding syllable; and the phonological length. In one token of the utterance *tapaa nainen ulkona* 'meet the woman outside', the four nasal portions had the following durations respectively: 85ms, 35ms, 70ms, 60ms.[10] The first one counts as the phonetic exponent of a 'long' nasal, while the others are 'short'; however, it can be seen that there is a wide range of variability in the measured durations. Clearly, there can be no simple phonetic interpretation of the categories 'long' and 'short'; and any interpretaion

10 cf. Flifilet (1971) who in discussing Finnish rhythm notes that consonants after long vowels are very short.

would have to make reference to position in the word, syllable, and foot. See Local & Ogden (1994) for a desription of a computationally implemented method for generating consonant durations for English in a declarative metrical framework.

Occasionally, my informants demonstrate a feature judged typical of their dialect: after a short open syllable, and before a long vowel, phonologically short consonants can be durationally long. This type of lengthening depends purely on the metrical structure and plays no part in morphosyntactic processes, unlike the well-known 'consonant gradation'. This is not a feature of Standard Finnish, and is not reflected in the orthography.

48. mɛnːɛː ʋaɦa ʔɑlɑˑs pæ̃ĩ nːi̯ːŋkʊsːaɦ
menee (mennee) vähän alas päin niin kuin sinä (sä)...
goes down a bit like you...

49. ei mitːɑ̈ːn
ei mitään
nothing

3. Inter-word Junctions in Finnish.

This Section presents a Firthian Prosodic Analysis of inter-word junctions in Finnish. Some of the phonetic facts described in Section 2 are taken account of by the analysis presented here, and more data is presented to back up the analysis.

In Fithian Prosodic Analysis, syntagmatic relations can be considered primary: one starts by considering how linguistic items are put together. This avoids the need for assimilation rules (Sprigg 1957), and may also avoid the need for deletion rules. The fundamental nature of syntagmatic relations is expressed by Whitley (ms), below:

> 'You can't tell from your isolate form what the junctions will be. You have to start from the junctions—you *can't* work from the isolates and say x *becomes* y in certain circumstances.'

Thus, for Whitley, citation forms ('isolates') do not provide the starting point of the analysis; instead, she prefers to begin with items in connection with one another. This is how the analysis of the Finnish material in this section is conducted. The resulting statement is very different from one which starts out with citation forms which have to be altered to fit in with rules of word juncture. I will also show how at least some of the observations made in the preceding section can be taken into account.

In the analysis presented in this Section, I shall assume a structure $\omega\text{-}^{\pi}\text{-}\omega$, where ω stands for 'word', and π for a system of word junctions. I shall then consider whether the terms of this prosodic system can usefully be reused in the prosodic system of syllable joins within words.

In all, there are six terms of the prosodic system of inter-word junction in Finnish: **n g h** ζ ʔ τ. As long as the stated structural constraints are not violated, up to two prosodies of word junction may operate at one place in structure; but every ω—ω structure must contain at least one prosodic term. The term is largely (but not entirely) determined by 'phonematic' structure, although lexical and morphological structure also play a part. I shall consider each kind of junction in turn, considering firstly its distribution (i.e. its phonological status), and secondly its phonetic exponents. The term **N** is used as a word-final phonematic unit whose exponents include nasality; it is a term more delicate than **C** (which merely stands for any term of the relevant **C**-system) and as delicate as **P**, which stands for a subterm of the **C**-system and whose phonetic exponents at normal tempo include complete oral closure.

The data in this Section have a different relevance from the data in the preceding Section, and are consequently presented differently. In this Section, the focus is more on the relations between the phonetics, the phonology, and other levels of linguistic statement such as the grammar. Therefore, impressionistic records annotated with the junction prosodies in bold superscript are given, along with the generalised partial phonological structure of which the phonetics is an exponent, a brief account of the morphological structure of the items, and an English gloss.

3.1 n

Distribution of **n**

n is found at the junction of two words where one word ends in **-N** and the subsequent word begins with a **C-** whose exponents include maintainable oral stricture (Catford 1988: 63) which involves the actual physical contact of an active and passive articulator; ie. the exponents of **C-** include [p t k m n s l r ʋ], but preclude [j h].

Exponents of **n**

n pieces are characterised by the same place of articulation across the syllable ending and the syllable beginning. The presence of nasality determines the presence of voicing, but nasality may terminate before voicing. In the case of the exponents of the structure **-N ^{n} P-**, voicing may extend into the closure portion which is one exponent of **P-**. Nasality may occasionally extend into the syllable beginning and combine with labiodentality or laterality.

Nasality is perhaps best regarded as the exponent of **-N**, but the temporal extent of nasality may best be regarded the exponent of **n**.

Note that what is accounted for by **n** is accounted for in other analyses by rules of assimilation (eg. Karlsson 1982: 144). These rules assume that the base form of the word ends in /n/: when a word with final /n/ precedes a word with, eg., initial /p/, then the nasal assimilates. Such assimilation rules are only necessary because the starting point of the analysis is citation form words; these forms are dealt with under **τ** below. Furthermore, these analyses do not account for the range of variability in the exponents of pieces of the structure **-N v-**, where the exponents of **v** are labiodentality and approximation (cf. Section 2.5).

Examples:

50. mu:tamaŋ ^{n} kort:člîm ^{n} pa:fianh ^{τh}
C—N ^{n} P—N ^{n} P—N ^{τh}
{several+gen block+gen top+ill}
down a few blocks

51. nainɛ̆·ŋ ⁿ kaufiistu:
C—N ⁿ P—V
{woman+nom, is terrified+3ps}
the woman is terrified

52. mentava ζ takaisiŋ ⁿ goti:n ᵀ
C—V ζ C—N ⁿ P—N ᵀ
{go+pass+pres. part back home+ill}
has to go back home

53. ɑven ⁿ mali:n ᵀ
V—N ⁿ C—N ᵀ
{door+gen through+ill}
through the door

54. ɑn ᵀʔ ɑsta: ζ kiŋ ⁿ gel:ŏn ᵀ
C—V ᵀʔ V—V ζ C—N ⁿ P—N ᵀ
{3ps+nom buy+3ps clnuc clock+gen}
and he buys the clock

3.2 ᵀ

Distribution of ᵀ

ᵀ occurs in several structures: (i) Wherever the first part of a junction is any term of the final -C system except -N. (ii) When any -C term (including N) is utterance-final. (iii) In the structure -N ᵀ C-, where the exponents of C- include a non-maintainable stricture, or no stricture (ie. [j h]). (iv) In the structure -N ᵀ V-.

In the recorded material, there are stretches identified as words with final consonantal portions [s t n]; this list may not be exhaustive, since in theory, [l r] could also occur word-finally.[11] Therefore no conclusive statement about the overall system of syllable (or word) final terms is made here.

11 Finnish dictionaries list items such as *askel*, 'step', *manner* 'mainland'.

Exponents of τ

The exponent of τ is the apical articulation of the exponent of the word-final C-term.

Examples

55. jokaˑ ζ õŋ ⁿ kĭn ᵀ hyŏĭn ᵀʔ ɲlõĭnẽn ⁿ tavaˑtẽsːaːn ᵀ
C—V ζ V—N ⁿ P—N ᵀ C—N ᵀʔ V—N ⁿ P—N ᵀ
{rel. pron.+nom. sg be+3ps+clitic very happy+nom meet+inf+iness+3pers. poss}
who is also very happy to meet (when she meets)

56. ʔ ʔulos ᵀ tapaːmɑ̰ːn ᵀʔ ʔyst^{ʔ}ɑ̰ʊ̯̃ːⁿsa g
ʔ V—C ᵀ C—N ᵀʔ V-ʔ-V g
{out meet+inf+ill friend+part+3pers poss}
out to meet her friend

57. ɦaneŋ ⁿ kavelːẽsːɑ̰̃ːn ⁿ talostă ζ pois ᵀ pâĭn ᵀ
C—N ⁿ P—N ⁿ P—V ζ C—C ᵀ C—N ᵀ
{3ps+gen walk+inf+iness+3pers poss house+elat away direction}
as she walks away from the house

3.3 ʔ

Distribution of ʔ

ʔ is found in two main structures: (i) when the second of two words is V-initial and the two words are not in what might be loosely called 'close grammatical contact' (see under ζ, Section 6.5.1.5 below), ie. in structures **-C ʔ V-** and **-V ʔ V-**; (ii) word-internally, where it frequently seems to be associated with resonant portions of long duration, such as long voiced lateral approximant portions, diphthongs or long vowels.

It should be pointed out that Itkonen (1965) shows that this type of word join is common only in the Savo dialects; and therefore the

statement presented here, while accounting for my informants' speech, may not apply more generally in Finnish.

Exponents of ʔ

The exponents of ʔ include creaky voice. Creaky voice is timed in interesting ways with other phonetic parameters. Usually, the creaky voice coincides with changes in the vocal tract, so that any vowel transitions at the join between two words are, so to say, 'covered' by the creaky voice. This is the most usual pattern in stretches which expone -V ʔ V- structures. In stretches which are the exponents of -N ʔ V- structures, where the exponents of -N include nasality, the creaky voice is generally timed to coincide with the closing of the velum and the ending of nasal airflow. It may however also be timed so that a small amount of creaky voice and nasal airflow overlap; but when the creak comes to an end, nasality is not present.

Another feature of periods of creaky voice is that they often mark areas where the pitch changes. It is not uncommon to find creaky voice between a stretch that ends with a low pitch, and followed by one which begins with a high pitch.

For reasons which remain unclear, diphthongs and long vocalic or resonant consonantal portions are all susceptible to creaky voice. In the case of diphthongs, the creak tends to start at the end of the steady state portion of the initial part of a diphthong. Otherwise, creak is timed to start coincidental with the onset of the resonant portion. It may be true to say that creaky voice is a sort of masking technique: a way to cover up transitions from one state to another. It remains unclear what function (if any) creaky voice may have word-internally. It could be that there is just a conventional phonetic association in Finnish between resonant articulations, the exponents of length, and creaky voice.

The duration of creaky voice is anything between 20 and 160 ms. These are extremes, however. It is most usual in the material collected to find creaky voice with a duration of approximately 60 ms (±20 ms). Sometimes the glottal constriction is so tight as produce periods of complete glottal closure; these are generally released into creaky voice. Therefore, it would be inaccurate to describe these portions as 'long

BEST COPY AVAILABLE

glottal stops' (cf. Itkonen 1965). Portions such as these are generally associated with creaky voice of greater duration.

Examples:

58. nainen ʔ ɨs·tu:
C—N ʔ V—V
{woman+nom sit+3ps}
a woman is sitting

59. jal:e:n ⁿ taka· ʔ ŋä a:ɾes:ä^{h} h
C—N ⁿ P—N ʔ V—V h
{again fireplace+gen edge+iness}
back by the fire again

60. h x̥aunis ʔ u̯:sɪ̯ ʕ mat:ð
h C—C ʔ V—V ʕ C—V
{beautiful+nom new+nom rug+nom}
a lovely new rug

61. ʔ ʔulos ᵗ tapɑ:mɑ̯:n ʔ ʔy̯stʔɑ̯uə̯̃:ⁿsa ᵍ
ʔ V—C ᵗ C—N ʔ V-ʔ-V ᵍ
{out meet+inf+ill friend+part+3pers poss}
out to meet her friend

62. purkʔɑ̯u̯tua
C-ʔ-V
{come undone+inf}
to come undone

3.4 g

Distribution of g

g occurs at the junction of certain morphological items with other words. Itkonen (1965) lists nine structural places where g occurs, of which the most important are: negative present tense forms; 2ps imperatives; first infinitive; most nouns which end in [-e]; the third person personal suffix (singular and plural), which has the phonetic exponents [nsɑ, nsa] and adverbs marked with the suffix whose exponents are [sti]. In all these cases, g is a property of the end of the named elements of structure. The vast majority of Finnish words that end in [e] are joined to the next word with g.

In the data collected, there are relatively few instances of structures where g applies. There are one or two instances of negatives, and a few instances of 3rd person personal suffixes with the exponents [nsɑ, nsa].

It seems reasonable from the available data to conclude that g only occurs in structures with the general shape **-V g C-**, where **C-** stands for a C-term whose exponents include oral stricture. Most studies of 'gemination' in Finnish include the possibility of the structure **-V g V-**, but the cases of this in my data have exponents which are not distinguishable from the exponents of the structure **-V ʔ V-**; since it simplifies the statement of exponents and is within the terms of the Principle of Reusability, I treat all the examples of potential **-V g V-** as the structure **-V ʔ V-**.

Exponents of g

The exponents of g include the prolonged duration of the closure phase for the succeeding consonant, where 'closure' means any consonantal stricture. Articulations which could be described as more tense are also frequently found as exponents of g pieces. For instance, short [ʋ], a labiodental approximant, is found as the exponent of a C-term which only occurs initially in the syllable; but the same C-term in conjunction with g may have the exponent [ʋ:], with a closer stricture as well as greater duration. Plosive bursts in g pieces are also frequently sharper than in non-g pieces.

Examples

63. {pp all ɦaŋ̊ěŋ̊ ⁿ all pp} kis:änsə̆ ᵍ k:at'so:
C—N ⁿ P—V ᵍ P—V
{3ps+gen cat+3pers. poss look+3ps}
her cat his watching

64. nainẽⁿ ⁿ sa: ˁ li:nansə̆ ᵍ v:almi:ksi
C—N ⁿ C—V ˁ C—V ᵍ C—V
{woman+nom get+3ps scarf+3pers. poss ready+transl}
the woman finishes her scarf

65. mut:a ˁ ɦanᵀ ei ˁ ɦuoma: ᵍ k:a:n ᵀ et:ä̆ ʔ
C—V ˁ C—N ᵀ V—V ˁ C—V ᵍ C—N ᵀ V—V ʔ
{but 3ps not+3ps notice+pres emphatic clitic comp}
but she doesn't even notice that

66. ʋi:doin ᵀ ɦe ᵍ p:a:sʱʋat ᵀ koti· ˁ oʊel:ẽʰ ʰ
C—N ᵀ C—V ᵍ C—C ᵀ C—V ˁ V—V ʰ
{finally 3ppl arrive+3ppl home+door+all}
finally they get to the front door

Descriptions of Finnish phonetics (eg. Itkonen 1965) frequently describe long glottal plosives as the exponent of the join between two words where one ends in a vowel and the next starts with a vowel, and where the first word is joined to consonant-initial words with greater duration of the initial consonant. This would lead us in the terms of the present analysis to posit the structure **-V gʔ V-** to complement the structure **-V g C-**. Greater duration would be allotted as the exponent of **g**, and the glottal stricture as the exponent of **ʔ**. However, in the few cases in the material where such a structure might apply, it seems not to. The phonetics of such potential structures is indistinguishable from the phonetics of the structure **-V ʔ V-**, and therefore I have chosen to state

the distribution of g in terms of the structure -V g C- only. For example, in the stretch

67. g t:ɑk:ɑ̆nsɑ' ʔ ʔɑ̯:res:a
g P—V gʔ V—V
{fireplace+3pers poss edge+iness}
by her fire

the stretch of creaky voice lasts approximately 85ms. We may expect to find the exponents of g in this stretch of phonetics, since we find greater duration in other places where the third person possessive suffix precedes another word. However, in the stretch

68. kaula ζ li:nɑʔ' ʔ ʔɑlkɑ:
C—V ζ C—V ʔ V—V
{neck+scarf+nom start+3ps}
the scarf starts

the period of creaky voice lasts approximately 160ms. This is almost twice as long as the duration of the stretch of glottal constriction in the example which potentially has g, but this is counterintuitive. The long duration could also not justifiably be said to be the exponent of g, since g is not otherwise used to put together the noun *liina* with some other word, nor any other pair of words, except where the first one ends in [-e]. It may also be fair to say that the material collected here is so small that no firm conclusions can be drawn from it.

3.5 ζ

Distribution of ζ

ζ occurs in all cases where the structure of the junction is -V C-. This is the commonest junction in Finnish, since most words end with V and most words begin with C (Wiik 1977). The most commonly found inter-word structure is -V ζ C-.

ζ is also found in those -V V- structures to which ʔ does not apply: between words which are in what we might characterise as 'close

contact'. This includes junctions with function words such as *mutta*, but, *ja*, and; the combination of *sanoa*, to say; *+että*, the complementiser; the negative verb; the verb *olla*, to be; and also between two items in a compound word where the first of them is V-final, and the second is V-initial. There is also a case in the data where ζ is found between a verb and the reflexive *itse*.

Exponents of ζ

The exponents of ζ include the presence of an open vocal tract accompanied by voicing followed by either a consonantal stricture with the same resonance as the subsequent part of the word or a vocalic portion, in which case the junction between the two vowels is marked by the absence of any glottal constriction, which is one exponent of ʔ. A change in resonance between front and back or back and front is one possible exponent of ζ, but is not criterial of ζ at word junctions.

Examples

69. vierestă ζ jă ζ lam:it:ele: ζ takɑ̆:nɑ̆^{h} ^{h}
C—V ζ C—V ζ C—V ζ C—V ^{h}
{side+elat and warm+3ps behind+ess}
...from the side and warms itself behind...

70. ʔ ʔystaval:e:n ^{τʔ} u:t:ɑ ζ fiienoɑ ζ kaulali:na:^{h} ^{h}
ʔ V—N ^{τʔ} V—V ζ C—V ζ C—V ^{h}
{friend+all+3pers. poss new+part fine+part neck+scarf+part}
(to) her friend the fine new scarf

71. mut:ă ζ ystavɑ̆ ζ fiuomɑ: ζ kin ^{τ}
C—V ζ V—V ζ C—V ζ C—N ^{τ}
{but friend+nom notice+3ps clitic}
but the friend notices as well

72. jɑ ζ alkɑ: ζ neuloɑ ^{h}
C—V ζ V—V ζ C—V ^{h}

{and start+3ps knit+inf}
and starts knitting

73. koti· ζ ovel:ɕʰ h
C—V ζ V—V h
{home+door+all}
to the front door

3.6 h

Distribution of h

h is found finally and sometimes initially in the utterance. It marks initiality and finality. Not all initials nor finals are marked with **h**.

Exponents of h

The exponents of **h** remain somewhat inconclusive. They involve absence of regular vocal fold vibration (ie. presence of breathy voice, creaky voice, whispery voice, or simply release of air through the vocal tract). They may also involve relative more open, laxer, articulations. They may also involve the aspiration of plosives, and even slight affrication.

Examples

74. ja ζ nainẽŋ n keit:a: ʔ ay ystava ʔl:eŋ n kahvit^{h} th
C—V ζ C—N n P—V ʔ V-ʔ-N n P—C th
{and woman+nom cook+3ps friend+all+3pers. pos coffee+acc. pl}
and the woman makes her friend coffee

75. h sɛ ζ oʔn: t hỹʊ̃in n ty:pil:istah h
h C—V z V-/-N t C—N n P—V h
3ps be+3ps very typical+part. sg.
it's quite typical

76. ^{h} χaunis $^{τ?}$ ų:sɪ ζ mat:ð

h C—C ų/ V—V z C—V
{lovely+nom new+nom rug+nom}
a lovely new rug

77. sulkɛ: ζ ʋerfiot^{s} th

C—V z C—C th
{shut+3ps curtain+nom.pl}
closes the curtains

3.7 The verb *olla*, to be

For the structure -C/V ^{π} V-, the usual term of π is ?. However, when words are in what I loosely termed 'close grammatical contact', they are more frequently joined by ζ. In this section, I shall consider in more detail the phonetics of the verb *olla*, to be, which exhibits rather complex word joins. This shows that the analysis presented in 3.1-6 is partial, and points to the need for an even more refined statement than the one given in this paper.

Examples 78-80 show the verb *olla* linked with ζ:

78. jɑ̆ zɛ̆ oŋ

ja se on
and it is

79. ni: {all ma õm all} pi:rtanyh

niin, minä (mä) olen (oon) piirtäny(t)
yes, I've drawn (it)

80. ei ne kovĩ ?isoːjɑ ɑ: naː kuɣkɑːt

ei ne kovi(n) isoja ole (olo) nää kukat
they're not very big, these flowers

There are in fact a variety of ways in which the verb *olla* or its parts may be joined to the preceding items. One of the common frames in my

data is 'these are —'. For this, the Standard form is *nämä ovat*.. My informants' productions typically resemble those at (81).

81(a) {p nãmʸˑɑ̣ˑtˌ p}
81(b) {p nãmaɑ̣ˑtˌ p}

It can be seen that the initial part is always [n̡ãm-]. Then there is an open portion which has some labiality in it and is dark, though the darkness may vary in its domain from the nasal portion to the end, or not start till later in the second syllabic portion. It is difficult to know how many syllables there in in these utterances; but it is certainly not the four implied by the orthography. For the phrase 'they are unemployed' my informants produced:

82. {p hcʷɒ̯ p}tːʸøtːømijə̆̃
he ovat työttömiä
they are unemployed

where it can be seen that there is labiality, but the expected amount of syllabicity is not present. A more extreme form of this lack of syllabicity as a distinct exponent of the verb *olla* can be seen in examples such as:

83. ɑn̡mătilːɑ̃ˑn ʔisoˑ mɑn̡ɑˑ
ahmatilla on iso maha
the greedy person has a big stomach

84. ketũˑŋ kolõːm puːtɑ̯r̥hə̆̃sːə̆̃
ketun kolo on puutarhassa
the fox's den is in the garden

In these cases, greater duration of the word-final vowels of the items just before the verb followed by nasality seems to be doing the work of the third person singular form of *olla*. In many instances, then, the verb *olla* seems to behave almost as if it were a clitic, and forms a special piece with the preceding item in the sequence of the speech. Much of

the phonetics typical of other items with apparently similar phonological structure (i.e. -V V- pieces) is not to be found, and much of the phonetics of this verb is unlike that which is to be found with other verbs.

Frames such as *nämä ovat* and pieces where the items before the verb *olla* end in anything other than complete oral closure are commonly marked as 'lax' in my records: they tend to be articulated quickly, with less close stricture, more breathiness, and with unclearly differentiated syllables (i.e. it is often hard to say how many syllables one hears). They are often also quieter. Perhaps surprisingly, when the item before the verb ends in a consonant with complete oral stricture (with or without nasality as well), this portion of complete closure can be long before the verb *olla*:

85. han: on tʸøtøn
hän on työtön
s/he is unemployed

86. ahmatit: ovat keit:jos:a
ahmatit ovat keittiössä
the greedy people are in the kitchen

In these cases, the way in which the word before the verb *olla* and the verb itself are joined phonetically is different from what is described above. Rather than having a juncture where material seems to go missing, here the juncture seems to be marked by 'more' material, i.e. greater duration. This could be treated as an exponent of g; however, it is the final consonant of the first item which is long, whereas in other cases where g joins words, such as the imperative, it is the initial consonant of the second item which is long.

Itkonen (1965: 248-265) discusses both these kinds of word join across the Savo dialect area, and notes that in his data most examples of -C ʕ V- (cf. exx. 78-80) involve the verb *olla* and the negative verb *ei*. Itkonen observes that this junction can only occur with 'close-knit compounds'. He also notes the junctions with long consonantal portions, and claims that they contain two distinct intensity peaks,

something which I did not observe with my informants. They are also rare in his material. While no clear conclusions can be drawn, it does seem clear that not all items can be handled in the same way in any complete analysis of Finnish word joins.

3.8 Spectrograms of examples of inter-word junctions

Figures 7-10 below show spectrograms of some of the utterances described in the previous section. The relevant details are commented on in conjunction with the appropriate spectrogram. The spectrograms are provided to show that phonetic exponency can be made to account to more than one kind of phonetic description.

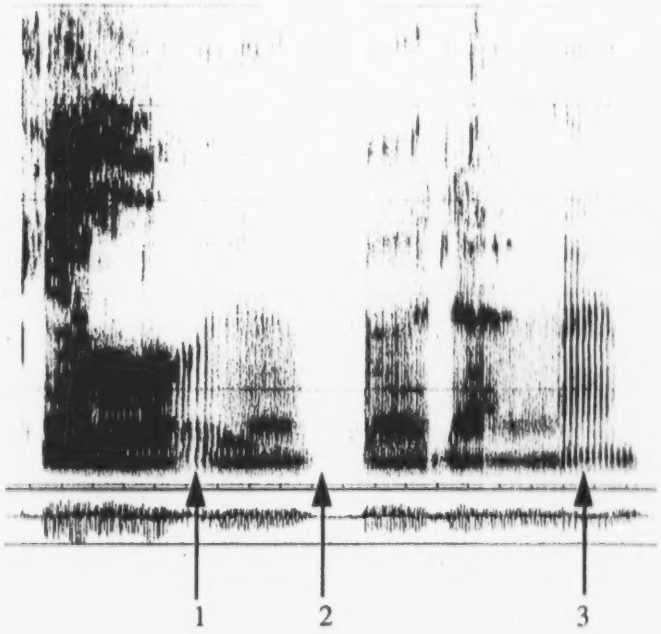

Fig.7: Spectrogram of 'Nainen keittää ystävälleen kahvit'.

Note that the temporal extent of voicing between the nasal and plosive portions is different at (1) and (3) in Fig. 7 above; this provides good evidence that temporal information is properly part of the phonetic exponency. The period of creaky phonation around (2) lasts approximately 130ms; this is approximately twice as long as other stretches of creaky voice in Figs. 34-36, yet there is no motivation for saying that the duration of this portion of creak is an exponent of **g?** rather than just **?**. Note that the final plosive burst is rather diffuse, aspirated, and does not have such a well-defined burst as at (1) and (3); this lax articulation is an exponent of **h**. The structure of the whole utterance, then, is C—N ^{n} P—V $^{?}$ V—N ^{n} P—C ^{h}.

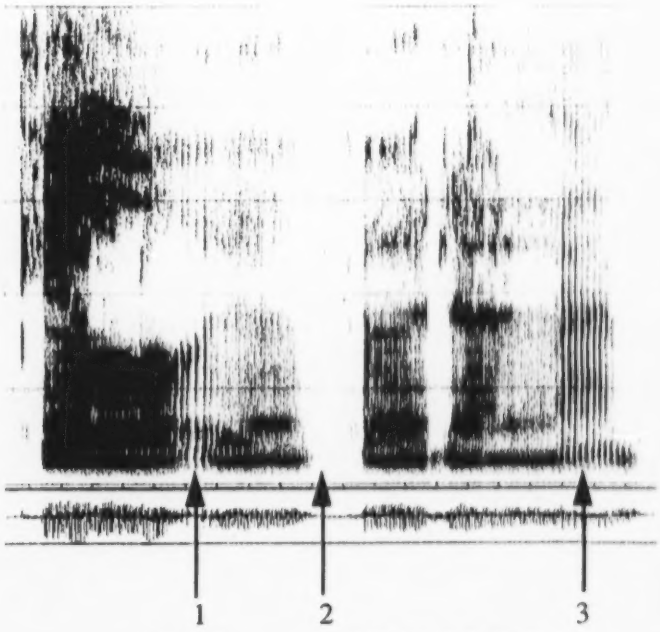

Fig. 8: Spectrogram of 'Kello yöpöydällään'.

In Fig. 8, note the creaky voice at (1), which extends for about 60ms. Note also that the formant transitions are timed to coincide with this stretch of creak, so that the non-creaky portions before and afterwards contain more or less steady state formants. At (2) are the exponents of ζ, a voiced vocalic portion followed by a portion with consonantal stricture. Note how at (3) the creaky voice is timed to coincide exactly with the release of lateral airflow, thus masking any formant transitions out of the lateral. It remains unclear why creaky voice should associate with stretches such as long vowels. The phonological structure for this utterance is C—V ʔ V—V ζ C-ʔ-N, since the word *yöpöytä* is a compound noun, *yö* 'night' + *pöytä*, 'table'.

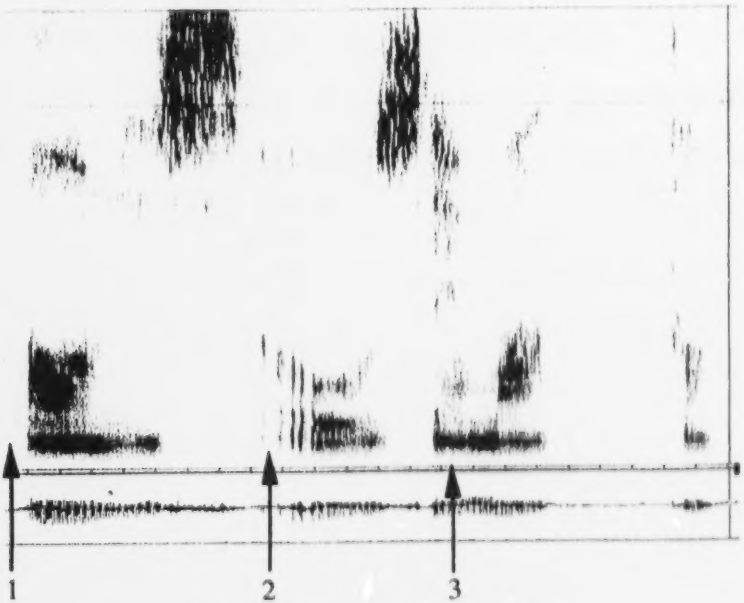

Fig. 9: Spectrogram of 'Kaunis uusi matto'.

Fig. 9 shows the spectrogram for *kaunis uusi matto*, 'a lovely new carpet'. In this case, attention is drawn to the lax articulation of the

initial voiceless portion, which has a sudden onset, but lacks a clearly-defined burst, at (1); this is taken to be an exponent of h. Note that at (2) the exponents of ʔ are evident, and that the creaky voice is timed to coincide with the transitions from the preceding consonantal constriction into the vocalic portion at the beginning of the second word. At (3) the exponents of ζ are again evident from the unmarked transition from the vocalic portion at the end of one word and the consonantal portion at the start of the next. The structure of this phrase is h C—C τʔ V—V ζ C—V.

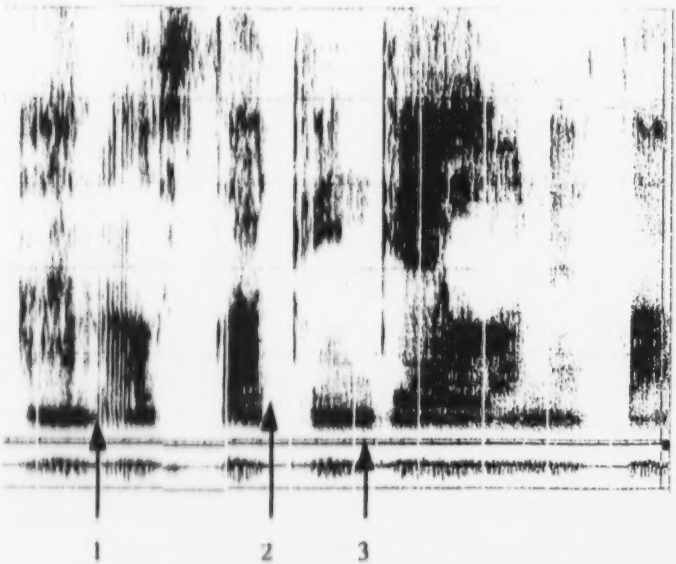

Fig. 10: Spectrogram of 'Hän ostaakin kellon jota...'

Fig. 10 shows the spectrogram of the phrase *hän ostaakin kellon jota...* 'and he buys the clock which...'. Note at (1) the exponents of ʔ; in this case the creak lasts for about 50ms. Note how again the creaky voice is timed to coincide with the offset of the consonantal articulation and thus covers the portion of the acoustic signal which exhibits the greatest

amount of formant transitions. The portions at (2) and (3) can be usefully compared, since both show velar closure followed by a plosive release. At (2) the closure is clearly unvoiced, and the structure is —V ζ P—, since the two words are in close grammatical contact (verb + clitic). At (3) on the other hand, there is obvious voicing in the closure portion; this is attributable as an exponent of **n**. The overall structure of the phrase then is C—N ʔ V—V ζ P—N n P—C τ C—V.

3.9 Summary

Tables 1 and 2 present (i) the structures found in inter-word position, and (ii) the statement of exponents in broad terms of the inter-word prosodies.

Word-Final	Inter-word Prosody	Word-Initial
-N	n	C- (C-' = [p t k m n s l r υ])
-C or -V	ζ when in close grammatical contact; ʔ otherwise	V-
-C	τ	C-, V-, or utterance final
-V	g when morphology demands it; ζ otherwise	C-
-C or -V	h	utterance-final
utterance-initial	h	C- or V-

Table 1: Summary of the inter-word structures.

More than one statement above may apply, and two prosodies of inter-word junction may be combined; the structures -C $^{\tau}$? V- and -C $^{\tau h}$ # are possible, and do not contradict the above statements.

n	sameness of place of articulation of exponents of -N and C-.
?	creaky voice timed to coincide with changes in the vocal tract.
ζ	vocalic articulation followed either by a consonanatal articulation (in $^{\pi}$C- structures) or by a vocalic articulation with no intervening glottal constriction (in $^{\pi}$V- structures).
h	voicelessness, creaky voice, breathy voice or exhalation; laxer and more open consonantal articulations.
τ	apical articulation of -C.
g	long duration of C-.

Table 2: Summary of the broad exponents of the inter-word prosodies.

4. Conclusion

This paper has shown how a phonological statement can be made which takes into consideration phonetic characteristics which in most phonologies are considered irrelevant. Some of its important characteristics are:

1. A parametric phonetic statement is made in either acoustic or articulatory phonetic terms.

2. The phonological statement is made in phonological terms, which are abstract in the sense that they have no implicit phonetics.

3. The two levels of phonetics and phonology are connected by statements of phonetic exponency. These exponency statements need not be simple, in the sense that they may refer to more than one phonetic parameter (cf. Ogden 1995a).

4. The exponency statements account for what might be characterised as 'fine phonetic detail'. The resulting analysis is therefore based on, and accountable to, observed phonetic detail, some of which would be deemed irrelevant if an analysis were used which were based on

a phoneme concept, or which could only produce a broad phonetic level of description, such as most current work in generative phonology.

5. The phonological statement presented describes in declarative, non-process terms features of Finnish which are otherwise typically regarded as processes of assimilation, or the output of a series of rules; or ignored altogether.

6. The phonological statement makes reference to other levels of linguistic statement such as the morphosyntactic and interactional levels. Thus there is integration of different levels of lingusitic statement.

REFERENCES

Catford, J. C. (1988). *A Practical Introduction to Phonetics*. Oxford: Clarendon Press.

Docherty, G, Foulkes, P., Milroy, J., Milroy, L. (1995). *What is a phonlogical fact? The relationship between theory and data*. Newcastle University, ms.

Engstrand, O & Krull, D. (1994). Durational correlates of quantity in Swedish, Finnish and Estonian: cross-language evidence for a theory of adaptive dispersion. *Phonetica* 51. 80-91.

Flifilet, A. L. (1971). Une évaluation structurale du système syllabique finnois. In L.L. Hamerich, Roman Jakobson, Eberhard Zimmer (eds.). *Form and Substance*. Odense: Akademisk Forlag. 193-203.

Hawkins, S. & Slater, A. (1994). Spread of CV and V-to-V coarticulation in British English: implications for the intelligibility of synthetic speech. *Proc. ICSLP-94* 1. 57-60.

Hawkins, S (1995). Arguments for a nonsegmental view of speech perception. *Proc ICPhS* 3.18-25.

Henderson, E.J.A. (1971). *The Indispensable Foundation. A Selection from the writings of Henry Sweet*. London: Oxford University Press.

Itkonen, T. (1965). *Proto-Finnic final consonants. Their history in the Finnic Languages with particular reference to Finnish Dialects*. Helsinki: SKS.

BEST COPY AVAILABLE

Karlsson, F, (1971). Finskans rotmorfemstruktur: en generativ beskrivning. *Turun Yliopiston Fonetiikan Laitoksen Julkaisuja* 10. [The structure of Finnish stems: a generative description.]

Karlsson, F. (1982). *Suomen kielen äänne- ja muotorakenne*. Juva: WSOY. [The phonology and morphology of the Finnish language.]

Kettunen, L. (1981). *Suomen murteet: Murrekartasto*. Helsinki: SKS. [Finnish dialects: dialect atlas.]

Lahti, L.-L. (1981). On Finnish plosives. *Lund working papers in Linguistics and Phonetics* 21. 89-93.

Lehiste, I. (1965). Juncture. *Proceedings of the Fifth International Congress of the Phonetic Sciences*, Basel/New York: S. Karger, 172-200.

Local, J & Ogden, R. A. (1994). A model of timing for non-segmental phonological structure. *Proceedings of ESCA/IEEE workshop on Speech Synthesis*. 236-239.

Manuel, S. Y, Shattuck-Hufnagel, S., Huffman, M., Stevens, K.N., Carlsson, R. & Hunnicutt, R. (1992). Studies of vowel and consonant reduction. In *Proceedings of the Internaitonal Conference on Speech and Language Processing*. Vol. 2. 943-946.

Ogden, R. A. (1995a). *An exploration of phonetic exponency in Firthian Prosodic Analysis: form and substance in Finnish phonology*. D.Phil., University of York.

Ogden, R. A. (1995b). Where is timing? A response to Caroline Smith. Paper presented at LabPhon 4, Oxford. To appear in Amalia Arvaniti & Bruce Connell (eds) *Papers in Laboratory Phonology 4*. Cambridge: CUP.

Palomaa, J. K. (1946). Suomen kielen äännekestoista puhumaan oppineen kuuromykän ja kuulevan henkilön ääntämisessä. Publicationes Instituti Phonetici Universitatis Helsingiensis. [On the durations of Finnish sounds in the pronunciation of a deaf mute who has been taught to speak and a hearing person.]

Rapola, M. (1966). *Suomen kielen äännehistorian luennot*. Helsinki: SKS. [Lectures on the history of the Finnish language.]

Sovijärvi, A. (1938). *Die gehaltenen, geflüsterten und gesungenen Vokale der finnischen Sprache*. Helsinki: SKS.

Sovijärvi, A. (1957). The Finno-Ugrian Languages. In L. Kaiser: *A Manual of Phonetics*. Amsterdam: North-Holland. 312-324.

Sprigg, R. K. (1957). Junction in spoken Burmese. *SLA*. 104-138.

Suomi , K. (1980). Voicing in English and Finnish stops. A typological comparison with an interlanguage study of the two languages in contact. *Turun yliopiston suomen laitoksen julkaisuja* 10.

Suomi, K. (1985a). Yleissuomen /i/—/j/ ja /u/—/v/-oppositioiden rakenteellisista perusteluista. *Virittäjä* 89, 48-56. [On the structural motivations of the Finnish /i/—/j/ and /u/—/v/ oppositions.]

Whitley, E. (ms). Phonetic Analysis and Phonological Statement. Notes from a lecture course entitled *Phonetic Analysis and Phonological Statement*, taken by Eugénie Henderson. York: Firthian Prosodic Archive.

Wiik, K. & Lehiste, I. (1968). Vowel quantity in Finnish Dissyllabic words. *Congressus Secundus Internationalis Fenno-Ugristrarum*, I, Helsinki: Suomalais-ugrilainen Seura. 569-574.

Wiik, K. (1965). Finnish and English Vowels. *Turun Yliopiston fonetiikan laitoksen julkaisuja* 94. Turku.

Wiik, K. (1975). On vowel duration in Finnish dialects. *Congressus Tertius Internationalis Fenno-Ugristrarum*, I. Tallinn: Valgus. 415-424.

Wiik, K. (1977). Suomen tavuista. *Virittäjä* 81, 265-278. [On Finnish syllables.]

Wiik, K. (1981). *Fonetiikan perusteet*. Juva: WSOY. [The foundations of phonetics.]

Zsiga, E. C. (1994). Acoustic evidence for gestural overlap in stop sequences. *Journal of Phonetics* 22. 121-140.